

Thyroid storm in a polytrauma patient

***Corresponding Author: Tan Jia Miao**

Department of Internal Medicine, Hospital Tawau, Sabah, Malaysia.

Email: lmiaomiao_22@hotmail.my

Abstract

Thyroid storm is a potentially life-threatening endocrinologic emergency characterized by an exacerbation of a hyperthyroid state. Several inciting factors can instigate the conversion of thyrotoxicosis to thyroid storm; trauma is one such trigger, but it is rare. Here we describe a case of thyroid storm in a young man that was alleged in a motor vehicle accident where his thyroid storm exhibited symptoms similar to traumatic hypovolemic shock.

Keywords

Thyroid storm; Polytrauma; Atrial fibrillation; Febrile.

Abbreviations:

FAST: Focused Assessment with Sonography for Trauma scan; AF: Atrial fibrillation; DIVC: Disseminated intravascular coagulation; ICU: Intensive care unit; TSH: Thyroid stimulating hormone; FT4: Free thyroxine.

Introduction

Thyroid storm is a potentially life-threatening endocrinologic emergency characterized by an exacerbation of a hyperthyroid state. Thyroid storm mortality rates are in the range of 8%- 25% despite modern advancements in its treatment and supportive measures. Hence prompt recognition is needed to initiate aggressive therapy. It can also cause diagnostic confusion after trauma as both can exhibit similar symptoms and signs.

Case Presentation

A 37 years old Bugis gentleman who was previously fit and well was alleged in a motor vehicle accident on 13/10/2022 where the patient was the lorry driver and he collided with the vehicle in front of him due to sudden malfunction of the brake. He was then presented to our Accident and Emergency Department. His Glasgow Coma Score remained full, BP 86/53, HR 140, respiratory rate of 30, and he was noted to be febrile with a temperature of 39°C. In the secondary survey along with trauma series of x-ray,

he sustained right pneumothorax with multiple ribs fracture, mangled injury over left leg and ankle, open fracture distal 1/3rd right ulna, closed fracture midshaft of right tibia and fibula, open fracture of right 3rd metacarpal joint. Bedside FAST scan showed no free fluid and no pericardial effusion with the absent sliding sign at the right upper chest. A chest tube was inserted immediately. He was in hypovolemic shock and required transfusion of multiple blood products including one cycle of the DIVC regimen. Case posted for an emergency operation for extensive wound debridement, wound exploration, and structural repair over the left leg with external fixation over the left tibia, wound debridement over right foot and right forearm, and hand with K-wire over right ulnar. Unfortunately, intraoperative left-above-knee amputation had to be done as the muscle were no longer salvageable. The estimated blood loss was 1 litre. Intraoperatively and postoperatively noted he had persistent tachycardic and febrile. Unfortunately, it was also complicated with traumatic rhabdomyolysis with refractory hyperkalemia needing urgent dialysis. However, dialysis was not able to complete as he developed fast AF during the dialysis and he was still febrile despite being covered with a broad spectrum of antibiotics. He also had episodes of fast AF on Day 2 and Day 3 of ICU admission which required amiodarone loading and maintenance dose. They were unable to extubate him as noted he was more restless and needed sedation. Hence the possibility of thyroid storm was suspected and urgent thyroid function testing was requested which showed TSH < 0.01 mIU/L and FT4 47.87 pmol/L. Burch- Wartofsky Point Scale (BWPS) at that time was 55. Diagnosis of thyroid storm was made based on clinical symptoms with the thyroid function impaired. The patient was commenced with antithyroid drugs, steroids, lugols iodine replacement via nasogastric tube and also beta blockade using propranolol. He showed marked improvement after that when he started to defervescence, he was less tachycardic, and had no more episodes of atrial fibrillation. He was able to complete dialysis as well and get extubated on day 7 of admission. He finally made an uneventful recovery and was transferred to the orthopedic ward. A repeated thyroid function test one week later showed TSH < 0.01 mIU/L and FT4 15.61 pmol/L. The patient has then discharged with T carbimazole 15 mg OD and planned to be reviewed in the clinic.

Discussion

Thyroid storm is a clinical syndrome marked by exaggerated manifestations of thyrotoxicosis. The diagnosis should be made clinically in a severely thyrotoxic patient with evidence of systemic decompensation. It can develop in patients with long-standing untreated hyperthyroidism, such as Graves' disease, toxic multinodular goitre, and solitary toxic adenoma, it is often precipitated by an acute event, such as thyroid or nonthyroid surgery, infection, and even trauma. Here we observed a case of a polytrauma patient who was treated as hypovolemic shock secondary to polytrauma injury. However, his persistent temperature spike and fast atrial fibrillation had raised the treating team on the suspicion of thyroid storm and with prompt recognition diagnosis of thyroid storm was made and eventually patient was stable on discharge.

Trauma-induced thyroid storm is characterized by increased levels of cytokines especially IL-6, causing impairment in the synthesis of albumin and thyroid-binding globulin in the liver, as well as increased concentration of circulating inhibitors. The consequences may include reduced protein binding leading to increased levels of free thyroid hormone, activation of the adrenergic nervous system, and enhanced sensitivity of peripheral cellular responses to thyroid hormone.

Adjunctive use of a sensitive diagnostic system should be considered in making the diagnosis of thyroid storm. Patients with a Burch–Wartofsky Point Scale (BWPS) of more than 45 or Japanese Thyroid Association (JTA) categories of thyroid storm 1 (TS1) or thyroid storm 2 (TS2) with evidence of systemic decompensation require aggressive therapy. The decision to use aggressive therapy in patients with a BWPS of 25–44 should be based on clinical judgment. In our case, the patient’s Burch–Wartofsky Score was 55, which is highly suggestive of thyroid storm.

One of the most striking features of thyroid storm is hyperpyrexia, as temperature have been reported to reach as high as 108.3° F (42.4°C). The central nervous system is often affected, and patients might experience anxiety, confusion, severe delirium, agitation, and psychosis. Nausea, vomiting, diarrhea, and even frank jaundice might ensue. From a cardiovascular standpoint, sinus tachycardia and increased systolic blood pressure are common; atrial and ventricular tachyarrhythmias and associated ventricular dysfunction and high-output congestive heart failure have also been reported.

Treatment of thyroid storm is multimodal and is best managed by the endocrinologist and medical intensivist. Supportive therapies such as intravenous hydration, oxygen, pressor agents (in the event of circulatory collapse), electrolyte correction, arrhythmia management, and aggressive reversal of hyperthermia should be delivered promptly. Medical therapy is directed at stabilizing the patient, correcting the hyperthyroid state, managing the systemic decompensation, and treating the underlying cause. After that, it should be followed by definitive treatment in the form of radioactive ablation or surgery and until then patients should be continued on antithyroid medications and a beta blocker.

In hypovolemic shock often there is blood volume loss with tachycardia. And this traumatic hypovolemic shock tends to mimic trauma-induced thyroid storm. And hence it is important to have a high index of suspicion so that correct treatment for thyroid storm can be given and it can lead to a dramatic change in the outcome as demonstrated in our case here,

Conclusion

Thyroid storm presentations can vary and are often confounded with other differential diagnoses such as sepsis, and hypovolemic shock. In trauma patients diagnosing thyroid storm can be even more difficult due to many of the overlapped manifestations of thyrotoxicosis. And hence always having a high index of suspicion among clinicians will allow prompt diagnosis and decrease mortality.

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Authors Information: Tan Jia Miao

Department of Internal Medicine, Hospital Tawau, Sabah, Malaysia.

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